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Jesper Hedal Kløverpris, the winner of the SETAC Europe young scientist LCA award 2010

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At the 20th SETAC Europe Annual Meeting in Seville, Spain, 23-27 May 2010, Jesper H. Kløverpris received the SETAC Europe Young Scientist LCA Award 2010 (see also Collée and Heinrich 2010). *This award initiated a 2-year free subscription in print and online of "The International Journal of Life Cycle Assessment".*

1 Motivation of the nomination of Jesper Hedal Kløverpris for the SETAC Europe young scientist LCA Award by Michael Z. Hauschild, DTU management engineering (on behalf of the SETAC Europe LCA steering committee)

1.1 Consequential life cycle inventory modelling of land use induced by crop consumption

Jesper Hedal Kløverpris did his Ph.D. on "Consequential Life Cycle Inventory Modelling of Land Use induced by Crop Consumption". It was an industrial Ph.D. project in collaboration between DTU Management Engineering at the Technical University of Denmark and Novozymes. He defended his dissertation in September 2008.

The purpose of the dissertation was to investigate where and how much the global agricultural area changes as a result of increased crop consumption in specific regions. For Novozymes, his host company, starch is one of the most important raw materials for the fermentation processes producing the enzymes that are the main component of the company's product portfolio. Coming from a country that has basically already incorporated all of its land suitable for agriculture, it was clear that increased crop consumption in Denmark would not affect the agricultural area within the country but most likely have an effect elsewhere. In order to be able to determine the environmental impacts of this effect and relate it to a functional unit of crops, it was necessary to estimate where land use changes would take place and how large they would be. It would thereby be possible to include these indirect land use changes in LCA.

1.2 Life cycle inventory modelling of land use induced by crop consumption. Part 1: conceptual analysis and methodological proposal

Jesper Hedal Kløverpris approached the challenge by first identifying and analysing the mechanisms influencing the land use consequences resulting from changes in crop demand. The findings were reported in his first paper, published online in the *International Journal of Life Cycle Assessment* in October 2007 (Kløverpris et al. 2007). The paper described the conceptual analysis of crop production, and on this basis, a proposal to use economic modelling for the estimation of indirect land use change was set forth and discussed. More specifically, it was suggested to use the Global Trade Analysis Project (GTAP) model, which is an economic model with a global scope.

1.3 Life cycle inventory modelling of land use induced by crop consumption. Part 2: example of wheat consumption in Brazil, China, Denmark and the USA

In collaboration with economist and GTAP modeller, Kenneth Baltzer from the Institute of Food and Resource Economics at the University of Copenhagen, Jesper went

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on to modify the standard GTAP model and demonstrate how it could be used to determine the international land use changes indirectly caused by wheat consumption in four different geographical regions. On top of this, Jesper used geographical data to get an indication of the ecosystems (or more correctly, biomes) that would be affected by the modelled land use changes. The biome analysis was published separately in the *Journal of Cleaner Production* in the fall of 2008. The full and combined analysis was published online by the *International Journal of Life Cycle Assessment* in October 2009 (Kløverpris et al. 2010).

In these papers, Jesper demonstrates how the proposed consequential approach to land use modelling in LCA solves a long-known problem of allocating impacts from a one-time land use change (transformation) to different subsequent land use activities. A similar time-related problem has arisen in the debate on greenhouse gas emissions from indirect land use change caused by biofuels, and based on his Ph.D., Jesper is now working on a proposal for how to solve this problem.

1.4 Modelling global land use and social implications in the sustainability assessment of biofuels

Jesper's work is of obvious relevance for the sustainability assessment of biofuels, and as part of his Ph.D., Jesper was the main driver behind an OECD-sponsored international workshop and conference that took place in Copenhagen in June 2007. The full title of the conference was *Modelling Global Land Use and Social Implications in the Sustainability Assessment of Biofuels*. Approximately 40 international scientists from the fields of environmental assessment, economic modelling, geography and sociology took part in the event. Following the conference, Jesper was the lead author of a synthesis paper summarising the main results and discussions. This paper was published by the *International Journal of Life Cycle Assessment* (Kløverpris and Wenzel 2007; see also Kløverpris et al. 2008), and the conference now forms part of the legacy of biofuels and land use conferences as one of the early events addressing this subject, which is increasingly discussed today.

1.5 Proposed regulation to implement the low carbon fuel standard

In spite of the very complex models underlying Jesper's research results, he managed to synthesise his main findings into tools that were applicable to his host company in their daily work with life cycle assessment of their broad range of products manufactured at production facilities located in different geographical regions. His work has also already had an impact in a broader decision making context, of which I would like to quote two examples.

The authorities in California used the GTAP model in their analysis of indirect land use changes related to biofuels when their 'Proposed Regulation to Implement the Low Carbon Fuel Standard' was published in March 2009, and the Environmental Protection Agency in the USA used a similar approach (although with different economic modelling) in their analysis of biofuels in the newly passed law on changes to the Renewable Fuel Standard, also known as the RFS2. Two of Jesper's papers were specifically cited in the notice of proposed rulemaking that came out for public comment in 2009.

1.6 Low carbon fuel standard

Following this, Jesper has been invited to participate in a workgroup established by the authorities in California to refine the greenhouse gas analysis in their Low Carbon Fuel Standard. The group consists of 23 international experts and eight US government officials.

1.7 European Handbook for LCA

During his Ph.D., Jesper was consulted by staff of the European Commission's Joint research Centre' Institute for Environment and Sustainability who ended up providing recommendations based on his work for the default modelling of land use changes in the European Handbook for LCA that they developed for the European Commission.

1.8 The modelling of land use

Overall, the Ph.D. work of Jesper Hedal Kløverpris constitutes a remarkable contribution to the methodological development within consequential LCA of land use changes. It stands out as a scientific contribution that has had and continues to have a significant impact on a very urgent issue in the development of life cycle assessment as a relevant and credible tool to support development of more sustainable technologies based on biomaterials—the modelling of land use.

On this basis, I strongly recommend Jesper Hedal Kløverpris for the SETAC Europe Young Scientist LCA Award. *Michael Z. Hauschild*

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Professional experience

- LCA specialist at Novozymes A/S
- Industrial Ph.D. student at Novozymes A/S and DTU (2005–April 2008)
- Replacement during maternity leave in Environmental Services, Novozymes A/S (November and December 2006)
- Student assistant at Danish University Consortium for Environment and Development—Industry and Urban Areas (2003–2004)
- Assistant teacher in ecology course at DTU (2001 and 2002)

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Review work

Review of scientific papers performed for *Journal of Cleaner Production, Biomass & Bioenergy* and *The International Journal of Life Cycle Assessment*

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